Clinoptilolite Zeolite Influence on Inorganic Nitrogen in Silt Loam and Sandy Agricultural Soils.

D.D. Tarkalson and J.A. Ippolito

Development of best management practices can help improve inorganic nitrogen (N) availability to plants and reduce nitrate-nitrogen (NO_3-N) leaching in soils. This study was conducted to determined the influence of the zeolite mineral Clinoptilolite (CL) additions on NO_3-N and ammonium-nitrogen (NH_4-N) in the soil/leachate system of two common Pacific Northwest soils (Portneuf silt loam and Wolverine sand).

Clinoptilolite was obtained from the Zeocorp LLC owned mine located in Hines, OR. Treatments for the Portneuf soil consisted of four CL rates (0, 6.7, 13.4, and 20.1 Mg ha^{-1}) and two application methods (incorporated and band). Treatments for the Wolverine soil consisted of four CL rates (0, 6.7, 13.4, 20.2, and 26.9 Mg ha^{-1}) and the two application methods. For each soil type, all CL rate treatments received a nitrogen fertilizer application rate of 224 kg N ha^{-1} as urea (46% N) on an area basis. Water was applied to all columns on a weekly basis. The total water applied over the duration of the study for both soil types was 11.3 inches. Leachate from each event was collected and analyzed NO_3-N and NH_4-N. At the end of the study soil from each column was analyzed for NO_3-N and NH_4-N.

In both soils, the band N application retained available inorganic N (NO_3-N and NH_4-N) in the soil/leachate system compared to incorporation. In the Portneuf soil, there was no effect of CL application rate (including the control) on the NO_3-N and NH_4-N in the leachate and soil; band N application resulted in 48% greater inorganic N in the soil/leachate system compared to when it was incorporated. In the Wolverine soil, band CL application at all rates conserved available inorganic N in the soil/leachate system compared to the control. For the band treatment, inorganic N in the soil/leachate system was 26% greater when CL was banded at all

rates compared to the control; this was not the case when CL and N were incorporated. Band applying N fertilizer appears to conserve available inorganic N in the soil compared to incorporation possibly due to decreased rates of microbial immobilization, nitrification and denitrification. In sandy soils, application of CL at a rate as low as 6.7 Mg ha^{-1} can help retain available inorganic N in the soil system.